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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/367,153	08/09/1999	ALASTAIR SIBBALD	62-194	3951
7590	07/21/2004		EXAMINER	
WILLIAM H BOLLMAN MANELLI DENISON & SELTER PLLC 2000 M STREET NW SUITE 700 WASHINGTON, DC 20036-3307			FAULK, DEVONA E	
			ART UNIT	PAPER NUMBER
			2644	
			DATE MAILED: 07/21/2004	

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	09/367,153	SIBBALD ET AL.	
	Examiner	Art Unit	
	Devona E. Faulk	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 01 May 2004.
- 2a) This action is **FINAL**.                                   2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 15-53 is/are pending in the application.
- 4a) Of the above claim(s) 44 is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 15-17,20-37,40-43,45-47 and 50-53 is/are rejected.
- 7) Claim(s) 18,19,38,39, 48 and 49 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:
  1. Certified copies of the priority documents have been received.
  2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Claims 15-53 are pending in the application. Claim 44 has been cancelled.
2. Applicant's arguments, see Paper No. 9, filed 5/1/04, with respect to the rejection(s) of claim(s) 15,17,20-25,27,30-35,37,39-45,47, 50-53 under 103 (a) have been fully considered and are persuasive. The applicant asserts, on page 21, lines 3-29, that regarding claims 15 and 17, that prior art Massie does not teach of the amended claim language wherein the magnitudes of the right and left channel are chosen, each based on a distance from the sound source to the respective one of the right and left ears respectively of the listener (claim 15) and wherein the lookup tables distance values correspond to distances between the source position and each of the respective ears of the listener. The examiner agrees. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Tanner, Jr. et al. (U.S. Patent 6,307,941).
3. Regarding independent claims 23,24,34,45,47,50-52 the applicants asserts, on page 21, lines 30-page 22, line 3, that each contain a distance limitation similar to that presented in either claim 15 or 17 and the same reasons given for claims 15 and 17 with respect to what the prior art does not teach apply.
4. Regarding dependent claims 18-22,25-33,35-43,48-49,52 and 53, the applicants assert, on page 21, lines 30-page 22, lines 4-8, that the dependent claims are allowable due to dependency on the independent claims. The examiner has new grounds of rejections for the independent claims and therefore the dependent claims are not allowable.

5. The indicated allowability of claims 16, 18,19,46,48 and 49 are withdrawn in view of the newly discovered reference(s) to Gibbs (U.S. Patent 5,901 232) and Nagamitsu et al. (U.S. Patent 5,467,401). Rejections based on the newly cited reference(s) follow.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 15,16,17,23,24,28,30,34 and 40** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941).

**Claims 15,16 17,23,24,28,30,34 and 40** share common elements.

**Regarding claims 15, 17, 23,24,28,30, 34 and 40** the applicant's admitted prior art discloses a prior art method of processing an audio signal. It teaches of left and right channel output signals created from a mono sound source, which reads on "providing a right channel and left channel, each of said right channel and left channel carrying said single channel audio signal"; both the left and right channel processed using HRTF on each channel separately which reads on "modifying said single channel audio signal of each of said right channel and said left channel using at least one of a plurality of head response transfer functions to provide a right signal in said right channel for a right ear of said listener and a left signal in said left channel for

a left ear of said listener”; both the right and left signals are delayed which reads on “introducing a time delay between said right channel and said left channel to provide cues to perception of a direction of said source position relative to said preferred position of said listener at a given time, and said time delay corresponding to an inter-aural time difference of said sound from sound source with respect to said listener”. The inter-aural time difference describes the time delay between sounds arriving at the left and right ears. It is well known in the art that inter-aural time difference is a source of localization cues. Tanner discloses a system and method for localization of virtual sound by modulating one or more spatial cues of an audio signal (column 2, lines 65-column 3, line 46). He teaches of the inter-aural time difference (ITD), which refers to the fact that a listener determines the position in space from which a sound originates based on the difference in time at the sound reaches the left and right ears of the listener and the inter-aural intensity difference (IID) that refers to the fact that variations in intensity levels between the left and right eardrums are interpreted by the human auditory system as changes in the spatial position of the perceived sound (column 1, lines 30-50). The ITD is indicative of distance of sound source with respect to the listener’s ears and therefore, indicative of the magnitude. This reads on “choosing respective values for magnitude of said left and magnitude of said right signal to provide cues for perception of a distance of said source position from said preferred position at said given time”.

**Claim 15** differs in that in recites “said respective values for magnitude of said left channel signal and said magnitude of said right channel signal being chosen separately, each based on the distance from the sound source to the respective one of the left and right ears of the listener. The method is obviously present. Thus, it would have been obvious to one of ordinary

skill in the art to choose respective values of magnitude of said left and right channel as claimed in order to provide improved virtual sound images.

Regarding **claim 24**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that there is a computer readable storage medium having a program with instructions. Tanner further teaches the concept of a microprocessor-based multichannel virtual sound system including a microprocessor (800) that is capable of performing the necessary calculations for real time processing of the incoming audio stream (Figure 8; column 10, line 10-column 11, line 16). Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use a computer program to implement the processing is for the benefit of producing a more robust virtual sound image.

All elements of **claim 28** are comprehended by claim 24. Therefore, claim 24 is rejected for reasons given above apropos of claim 24.

Regarding **claim 30**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 24, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

Regarding **claim 34**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that

there is an apparatus performing the method. All elements of claim 34 are the same as those of claim 15. Therefore claim 34 is rejected for reasons given above apropos of claim 15.

Regarding **claim 40**, the combination of the applicant's admitted prior art and Massie meet all elements of that claim, as stated above in apropos of claim 34, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

8. **Claims 16,20,26 and 36** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Gibbs (U.S. Patent 5,901,232).

Regarding **claim 16**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above apropos of claim 15, with the exception of "said respective values for magnitude of said left signal and said magnitude of said right signal being determined on an inverse of square of distance between said source position and respective ears of said listener". Gibbs teaches of distances determined by the sound intensities using the inverse square law for intensity vs. distance. It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

Regarding **claim 20**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

**Claim 26** claims the computer readable storage of claim 24. Regarding **claim 26**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective values for magnitude of said left signal and said magnitude of said right signal are determined based on an inverse of square of a distance between source position and respective ears of listeners. Gibbs teaches of distances determined by the sound intensities using the inverse square law for intensity vs. distance. It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

**Claim 36** claims the apparatus of claim 34. Regarding **claim 26**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective values for magnitude of said left signal and said magnitude of said right signal are determined based on an inverse of square of a distance between source position and respective ears of listeners. Gibbs teaches of distances

determined by the sound intensities using the inverse square law for intensity vs. distance. It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

9. **Claim 17,23,25,27,29 and 35** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Raydon et al. (U.S. Patent 3,969,588).

Regarding **claim 17**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception of the step of choosing respective values for magnitude of said left signal and magnitude of said right signal comprises providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Massie by having a look-up table to retrieve values for the benefit of reducing processing time.

Regarding **claim 23**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective magnitudes are determined by reference to a lookup table using the inter-aural time delay to determine the respective values for magnitude". Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

**Claim 25** claims the computer readable storage of claim 24. Regarding **claim 25**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that the respective magnitudes are separately determined by using an inter-aural time difference as an input parameter for a lookup table having magnitude values based on the distance from the sound source to the respective one of the left and right ears of the listener. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

**Claim 27** claims the computer readable storage of claim 24. As stated above apropos of claim 24, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim. Therefore, the combination meets all elements of claim 27 with the exception that the instructions for choosing respective values for magnitude of said left signal and magnitude for said right signals include instructions for providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain reads on the claimed matter. Tanner further teaches the concept of a microprocessor-based multichannel virtual sound system including a microprocessor (800) that is capable of performing the necessary calculations for real time processing of the incoming audio stream (Figure 8; column 10, line 10-column 11, line 16). Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to use a computer program to implement the processing is for the benefit of producing a more robust virtual sound image.

**Claim 29** claims the computer readable storage of claim 24. As stated above apropos of claim 28, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim. Therefore, the combination meets all elements of claim 27 with the exception that the instructions for choosing respective values for magnitude of said left signal and magnitude for said right signals include instructions for providing a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-

up table having gain reads on the claimed matter. Tanner further teaches the concept of a microprocessor-based multichannel virtual sound system including a microprocessor (800) that is capable of performing the necessary calculations for real time processing of the incoming audio stream (Figure 8; column 10, line 10-column 11, line 16). It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

**Claim 35** claims the apparatus of claim 34, wherein said means for choosing said respective values is adapted to choose said respective values for magnitude of said left signal and said magnitude of said right signal separately by using an inter-aural time difference as an input parameter for a lookup table having magnitude values based on the distance from the sound source to the respective one of the left and right ears of the listener. As stated above apropos of claim 34, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). It would have been obvious to modify the apparatus of the combination of the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

10. **Claims 21,31 and 41** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Abel et al. (U.S. Patent 6,009,178).

Regarding **claim 21**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception of the left signal and the right signal are compensated to provide at least one of a cancellation and a

reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

Regarding **claim 31**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 24, with the exception that the left signal and the right signal are compensated to provide at least one of a cancellation and a reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Using a computer program to implement the processing is obvious for the benefit of having the most precise and accurate data and to have stable operations. Thus it would have been obvious to

one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

**Claim 41** claims the apparatus of claim 34 further comprising a compensating means for providing at least one of a cancellation and a reduction of transaural crosstalk in said left signal and said right signal when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

11. **Claims 22, 32,33,42 and 43** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Sibbald et al. (U.S. Patent 5,666,425).

Regarding **claim 22**, the combination of the applicant's admitted prior art and Tanner meets all elements of that claim, as stated above in apropos of claim 15, with the exception of combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining

said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

Regarding **claim 32**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 24, with the exception of computer readable medium including an instruction for combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

**Claim 33** claims the computer readable storage medium of claim 32, wherein said set of instructions for combining said left and right channel with two or more channel audio signals comprises a set of instructions for combining adding respective contents of said left channel and said right channel to corresponding channels of said other two or more channel signals. The combination of the applicant's admitted prior art, Tanner and Sibbald meet all elements of claim 22. Combining the signals as claimed in 32 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

Regarding **claim 42**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 34, with the exception of the apparatus further comprising a means for combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

**Claim 43** claims the computer readable storage medium of claim 42, wherein said means combining comprises means for adding respective contents of said left channel and said right channel to corresponding of said other two or more channel signals. The combination of the applicant's admitted prior art, Tanner and Sibbald meet all elements of claim 42. Combining the signals as claimed in 32 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

12. **Claims 45-47,50-53** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941).

**Claims 45-47, 50-53** share common elements.

**Regarding claim 45-47,50-53,** the applicant's admitted prior art discloses a prior art method of processing an audio signal. It teaches of a mono sound source which reads on "an audio signal"; left and right channel output signals created from that mono sound source and both the left and right channel processed using HRTF on each channel separately which reads on "a right signal for a right ear of a listener, said right signal being obtained by modifying a single channel audio signal using at least one of a plurality of head response transfer functions, said single channel audio signal corresponding to a sound from a sound source located at a source position relative to a preferred position of said listener" and also reads on "a left signal for a left ear of said listener, said left signal being obtained by modifying said single channel audio signal using at least one of a plurality of head response transfer functions"; both the right and left signals are delayed which reads on "wherein said left signal and said right signal having there between a time delay to provide cues to perception of a direction of said source position relative to preferred position of said listener at a given time, said time delay corresponding to an inter-aural time difference of said sound from said sound source with respect to said listener". The inter-aural time difference describes the time delay between sounds arriving at the left and right ears. It is well known in the art that inter-aural time difference is a source of localization cues. Tanner discloses a system and method for localization of virtual sound by modulating one or more spatial cues of an audio signal (column 2, lines 65-column 3, line 46). He teaches of the inter-aural time difference (ITD), which refers to the fact that a listener determines the position in space from which a sound originates based on the difference in time at the sound reaches the left and right ears of the listener and the inter-aural intensity difference (IID) that refers to the fact that variations in intensity levels between the left and right eardrums are interpreted by the

human auditory system as changes in the spatial position of the perceived sound (column 1, lines 30-50). The ITD is indicative of distance of sound source with respect to the listener's ears and therefore, indicative of the magnitude. This reads on "respective values for magnitude of said left and magnitude of said right signal to are chosen to provide cues for perception of a distance of said source position from said preferred position at said given time".

Regarding **claim 45**, Tanner also reads on "said respective values for magnitude of said left signal and said magnitude of said right signal are being chosen separately". It is obvious that you would use the respective values of magnitude of the left and right signal to provide cues for perception of the source position from the preferred position at said given time because the goal is to achieve the best possible and most accurate sound. Thus, it would have been obvious to one of ordinary skill in the art to choose respective values of magnitude of said left and right channel as claimed in order to provide improved virtual sound images.

Regarding **claim 50**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 15, with the exception that at least one of said left signal and said right signal is sufficiently small as to be inaudible. This would be a matter of choice as to if one wanted one of the signals to be inaudible. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to make one of signals inaudible for the benefit of having sound produced to one ear.

13. **Claim 46** is rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Gibbs (U.S. Patent 5,901,232).

Regarding **claim 46**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above apropos of claim 15, with the exception of "said respective values for magnitude of said left signal and said magnitude of said right signal being determined on an inverse of square of distance between said source position and respective ears of said listener". Gibbs teaches of distances determined by the sound intensities using the inverse square law for intensity vs. distance. It is obvious that since distances can be determined from the gain, that the reverse is true and the magnitude can be determined from the distance. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use sound's inverse square law for intensity vs. gain in order to determine the coordinates of the external sound source.

14. **Claim 47** is rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Raydon et al. (U.S. Patent 3,969,588).

Regarding **claim 47**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 45, with the exception said respective values for magnitude of said left signal and magnitude of said right signal are chosen by selecting said values for magnitude from a look-up table having thereon distances between said source position and respective ears of said listener, said distances corresponding to associative ones of said values for magnitude of said left signal and said magnitude of said right signal and selecting said values for magnitude from said look-up table. Raydon discloses a look-up table having gain settings as a function of distance (column 19, lines 59-64). This reads on the claimed matter. It would have been obvious to modify the apparatus of the combination of

the applicant's admitted prior art and Tanner by having a look-up table to retrieve values for the benefit of reducing processing time.

15. **Claim 51** is rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Abel et al. (U.S. Patent 6,009,178).

Regarding **claim 51**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 45, with the exception that said left signal and the right signal are compensated to provide at least one of a cancellation and a reduction of transaural crosstalk when said left signal and said right signal are supplied through said left channel and said right channel respectively for replay by loudspeakers. Abel teaches of a system and method for providing a two-channel signal to the ears of a listener through an audio system comprising a crosstalk removal circuit (303; Figures 3A and 3B). Transaural means to deliver binaural signals to the ears of a listener using stereo loudspeakers. Therefore, Abel's system reads on the claimed matter. Crosstalk cancellation is well known in the art and is essential and critical to all head-related transfer function (HRTF) based 3D sound systems. Thus it would have been obvious to one of ordinary skill in the art at the time of filing to use transaural crosstalk for the benefit of delivering clean left and right channel binaural signals to the ears of the listener.

16. **Claims 52 and 53** are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admitted prior art (page 2, line 23; Figure 8) in view of Tanner, Jr. et al. (U.S. Patent 6,307,941) in further view of Sibbald et al. (U.S. Patent 5,666,425).

Regarding **claim 52**, the combination of the applicant's admitted prior art and Tanner meet all elements of that claim, as stated above in apropos of claim 45, with the exception of combining said left signal and said right signal with other two or more channel audio signals. Sibbald discloses plural sound processing where a left and right channel (36 and 38) are added to equalized left and right signal (44 and 46) using adders 48 and 50. This reads on "combining said left and said right signal with other two or more channel audio signals". Combining signals is well known in the art. It would have been obvious to combine the signals as claimed for the benefit of producing a left and right combined signal.

**Claim 53** claims the audio signal of claim 52, wherein said step of combining adding respective contents of said left channel and said right channel to corresponding channels of said other two or more channel signals. The combination of the applicant's admitted prior art, Tanner and Sibbald meet all elements of claim 52. Combining the signals as claimed in 52 inherently includes adding respective contents of said left and said right channel as claimed. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the left and right signals with two or more other channel audio signals for the benefit of producing a left and right combined signal.

#### *Claim Objections*

17. **Claims 18,19,38,39,48, and 49** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

18. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Devona E. Faulk whose telephone number is 703-305-4359. The examiner can normally be reached on 8 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Forester W. Isen can be reached on 703-305-4386. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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